

# 8.3

## Similar Polygons

184

- Goals**
- Identify similar polygons.
  - Use similar polygons to solve real-life problems.

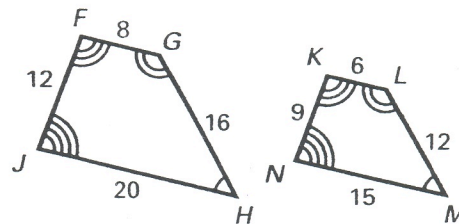
### VOCABULARY

Similar polygons

Scale factor

### Example 1 Comparing Similar Polygons

Decide whether the figures are similar. If they are similar, write a similarity statement.



### Solution

As shown, the corresponding angles of  $FGHI$  and  $KLMN$  are congruent. Also, the corresponding side lengths are proportional.

$$\frac{FG}{KL} = \frac{8}{6} = \frac{4}{3}$$

$$\frac{GH}{LM} = \frac{16}{12} = \frac{4}{3}$$

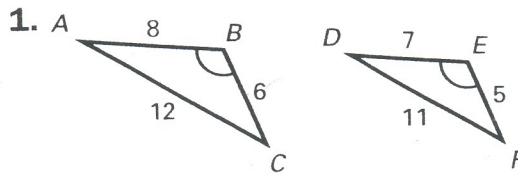
$$\frac{HI}{MN} = \frac{20}{15} = \frac{4}{3}$$

$$\frac{IF}{KN} = \frac{12}{9} = \frac{4}{3}$$

**Answer** So, the two figures are similar and you can write

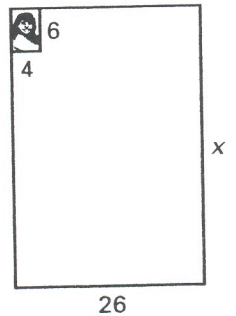
$FGHI \sim KLMN$ .

- ✓ **Checkpoint** Decide whether the figures are similar. If they are, write the similarity statement.



### Example 2 Comparing Photographic Enlargements

You have a 4-inch by 6-inch photo that you want to use for class election posters. You want the enlargement to be 26 inches wide. How long will it be?



#### Solution

Compare the enlargement to the original measurements of the photo.

$$\frac{26 \text{ in.}}{4 \text{ in.}} = \frac{x \text{ in.}}{6 \text{ in.}}$$

$$x = \frac{26 \cdot 6}{4}$$

$$x = 39 \text{ inches}$$

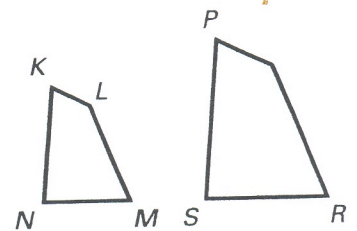
**Answer** The length of the enlargement will be 39 inches.

### THEOREM 8.1

If two polygons are similar, then the ratio of their perimeters is equal to the ratios of their corresponding side lengths.

If  $KLMN \sim PQRS$ , then

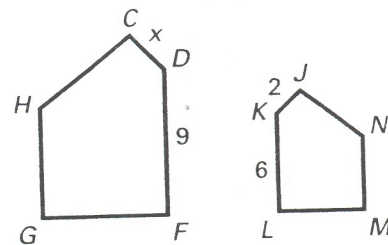
$$\frac{KL + LM + MN + NK}{PQ + QR + RS + SP} = \frac{KL}{PQ} = \frac{LM}{QR} = \frac{MN}{RS} = \frac{NK}{SP}$$



### Example 3 Using Similar Polygons

Pentagon  $CDFGH$  is similar to pentagon  $JKLMN$ .

Find the value of  $x$ .



#### Solution

Set up a proportion that contains  $CD$ .

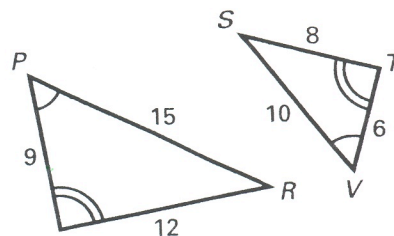
$$\frac{CD}{DF} = \quad \text{Write proportion.}$$

$$\frac{x}{9} = \quad \text{Substitute.}$$

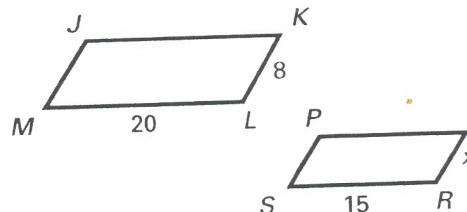
$$x = \quad \text{Cross multiply and divide by } \quad.$$

✓ **Checkpoint** Complete the following exercises.

2. Verify that these two triangles are similar. Write the similarity statement. Then find the ratio of their perimeters.



3. Parallelogram  $JKLM$  is similar to parallelogram  $PQRS$ . Find the value of  $x$ .



## Study Guide

8.3 Blue

## Similar Polygons

Two polygons are **similar** if and only if their corresponding angles are congruent and the measures of their corresponding sides are proportional.

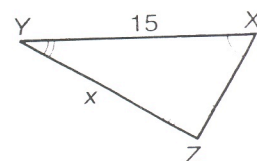
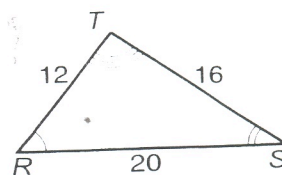
The symbol  $\sim$  means *is similar to*.

The ratio of the lengths of two corresponding sides of two similar polygons is called the **scale factor**.

**Example:** Find  $x$  if  $\triangle RST \sim \triangle XYZ$ .

The corresponding sides are proportional, so we can write a proportion to find the value of  $x$ .

$$\begin{aligned}\frac{16}{x} &= \frac{20}{15} \\ 20x &= 240 \\ x &= 12\end{aligned}$$



If quadrilateral  $ABCD$  is similar to quadrilateral  $EFGH$ , find each of the following.

1. scale factor of  $ABCD$  to  $EFGH$

2.  $EF$

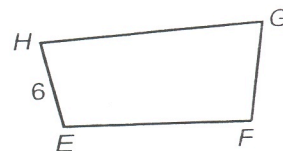
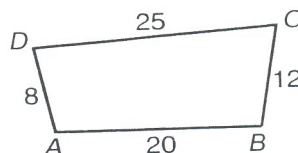
3.  $FG$

4.  $GH$

5. perimeter of  $ABCD$

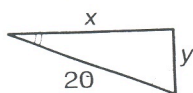
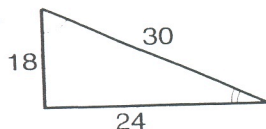
6. perimeter of  $EFGH$

7. ratio of perimeter of  $ABCD$  to perimeter of  $EFGH$

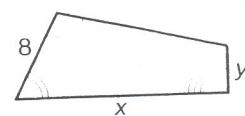
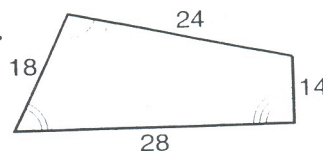


Each pair of polygons is similar. Find the values of  $x$  and  $y$ .

8.



9.





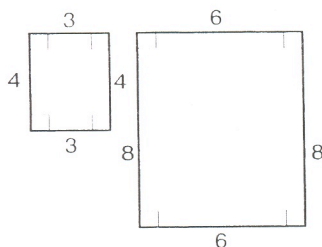
# Skills Practice

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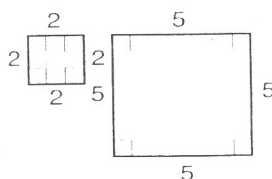
## Similar Polygons

Determine whether each pair of polygons is similar. Justify your answer.

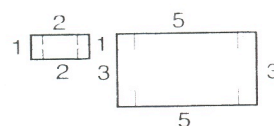
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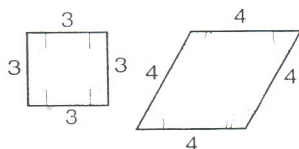
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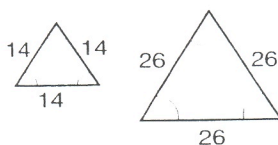
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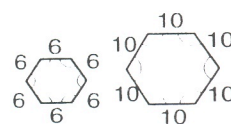
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5.

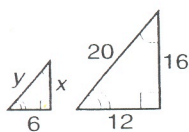


6.

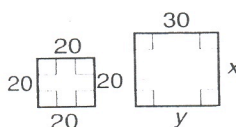


If each pair of polygons is similar, find the values of  $x$  and  $y$ .

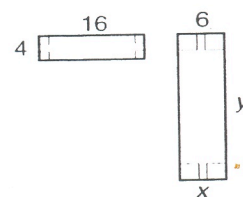
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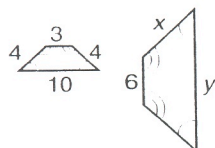
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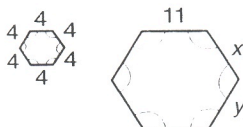
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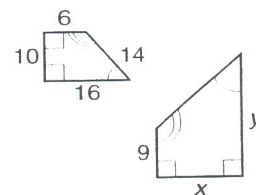
10.



11.



12.



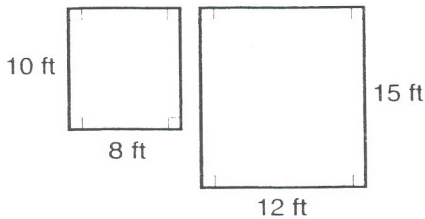
## Practice

8.3 Blue

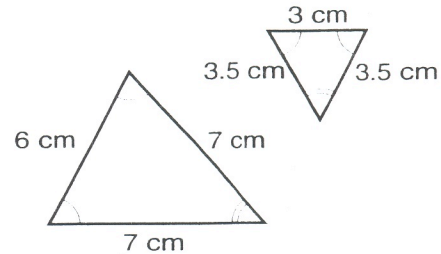
### Similar Polygons

Determine whether each pair of polygons is similar. Justify your answer.

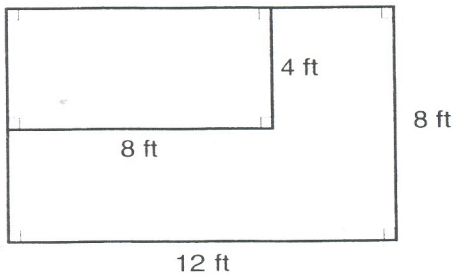
1.



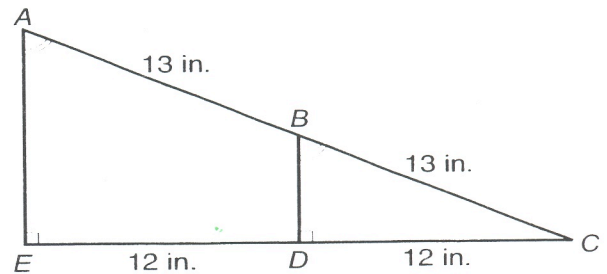
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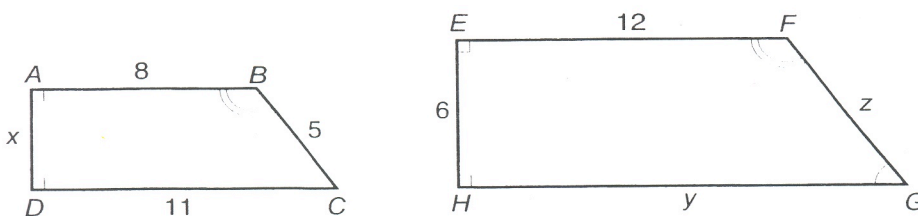
3.



4.



In the figure below, trapezoid  $ABCD \sim$  trapezoid  $EFGH$ . Use this information to answer Exercises 5–9.



5. List all pairs of corresponding angles.
6. Write four ratios relating the corresponding sides.
7. Write a proportion to find the missing measure  $x$ . Then find the value of  $x$ .
8. Write a proportion to find the missing measure  $y$ . Then find the value of  $y$ .
9. Write a proportion to find the missing measure  $z$ . Then find the value of  $z$ .